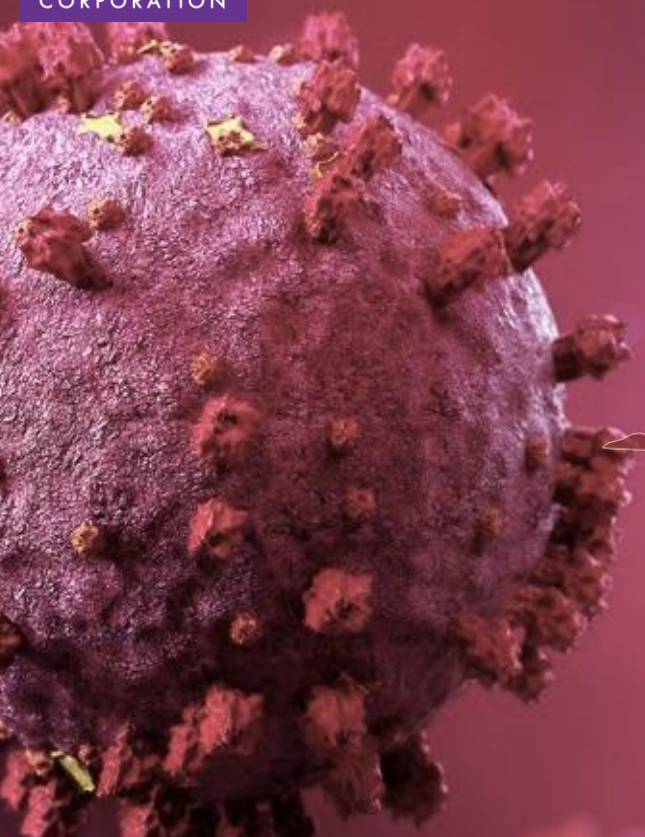
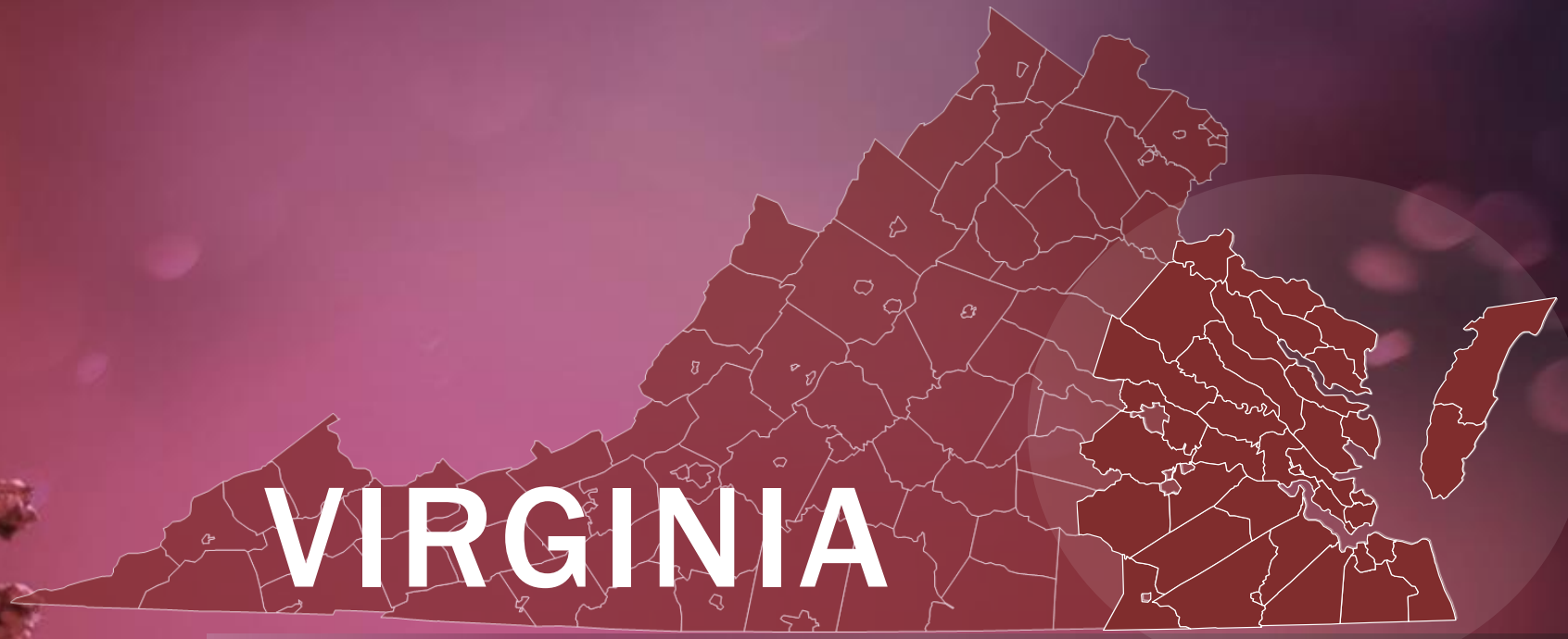




VIRGINIA

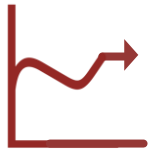
COVID-19 Update August 20th, 2020

Carter C. Price, Ph.D.

A team of RAND researchers was asked by the Commonwealth of Virginia to review available information on COVID-19 models of the commonwealth to determine the strengths and weaknesses of each model and their relevance to decisionmaking. The work of the research team will be documented in a forthcoming RAND research report. The information in this presentation is intended to keep policymakers abreast of the latest findings of the research team.

This research was sponsored by the Commonwealth of Virginia and conducted by the RAND Corporation. RAND is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest. For more information, visit www.rand.org.

Bottom-Line Up Front



Virginia's total case level has been plateauing

- However, case rates remain elevated along the border with North Carolina
- Hospitalizations have leveled off

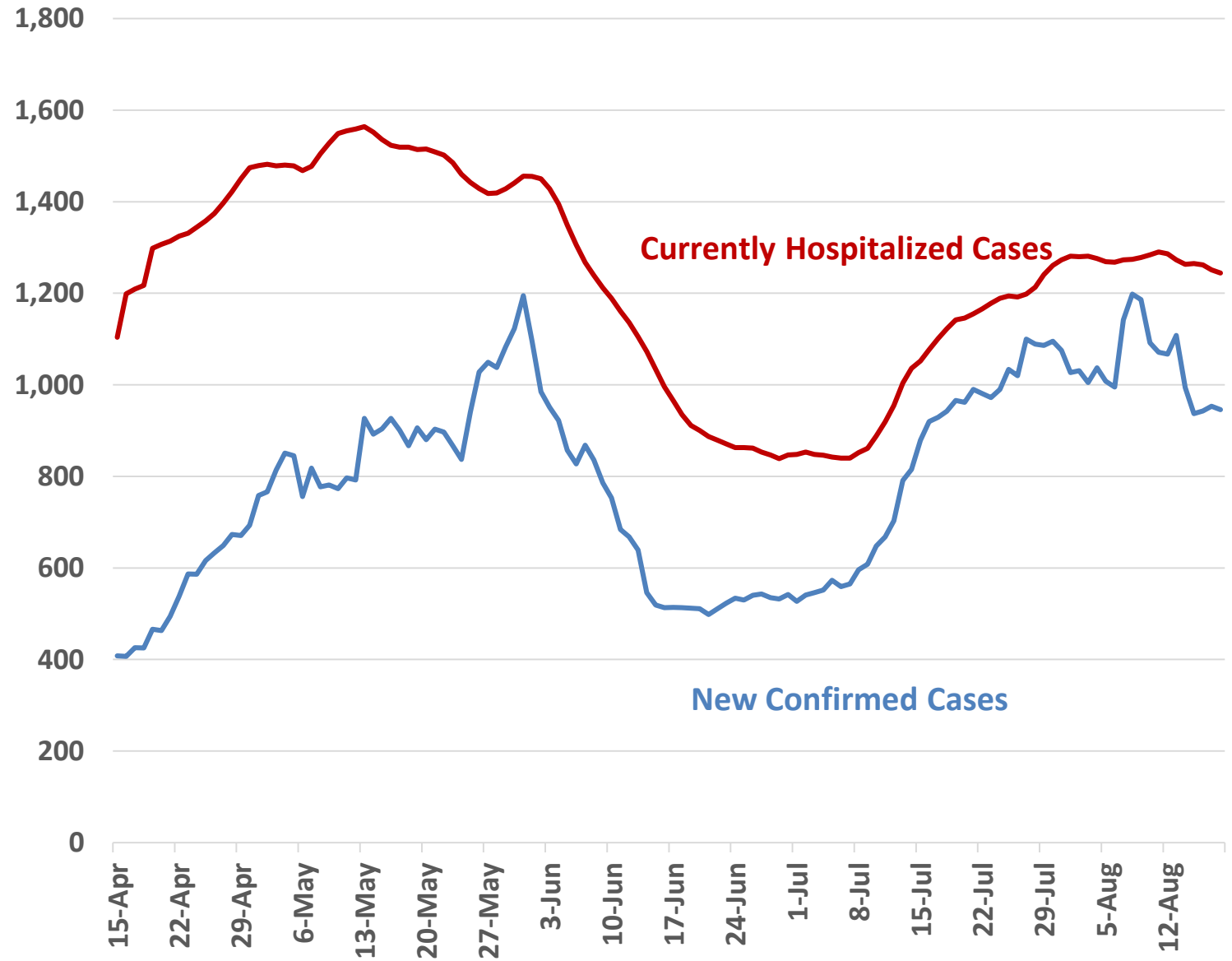
Additional triggers could lead to a rapid rise in next few months

- Seasonal changes
- Distancing fatigue
- School beginning in the fall
- Increased interstate travel
- Hurricane season

Modeling is less useful for forecasting because behavioral responses are driving current trends

- Models will continue to be very useful for comparing policies and exploring scenarios

The current trends indicate the new wave is continuing



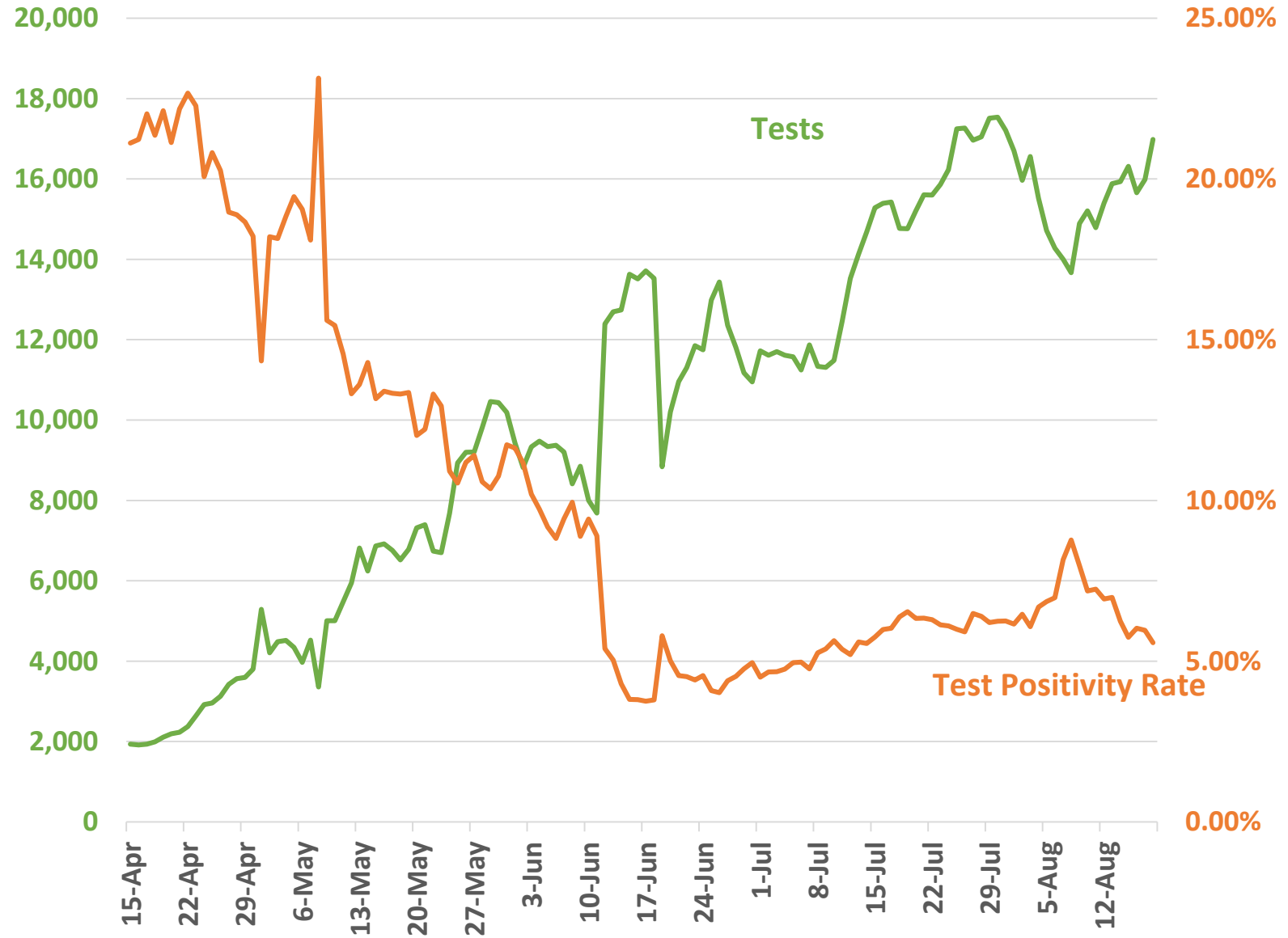
New confirmed cases have essentially plateaued

- After the inclusion of backlogged data at the end of July, the levels dropped back to the recent average
- The recent levels match the high from May, but testing has greatly improved so May was likely worse

Currently hospitalized cases have begun to slowly decline

- This is a lagging indicator and so will likely continue to slowly decline until a significant change in the case trends

Testing had been lagging but is now improving



Tests per day have ranged around 14,000 to 18,000 for the last month

- Testing levels are appropriate for a test-and-trace strategy
- Further reopening is estimated to require five times more testing along with lower case rates (See Rockefeller Foundation)

The test positivity rate has begun to decline since the early August peak

- Five percent is a suggested target
- This is not a “bright line” but the level indicates that testing is too low for the current case rate

Per capita new cases are highest in the southern counties

CASE COUNT

Source: VDH

Yellow indicates at least 20 cases per 100,000

Virginia's southern counties have continued to see high case levels

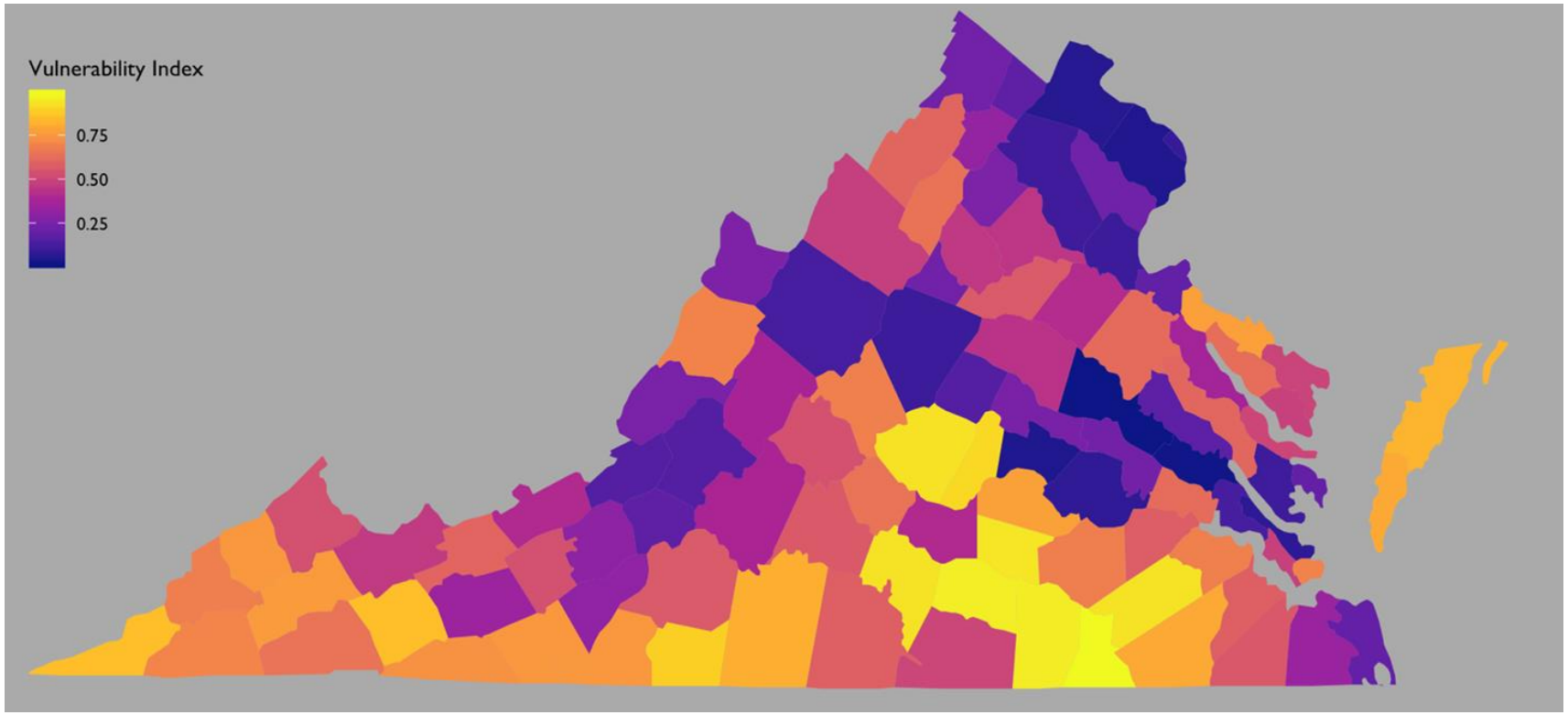
Case counts have fallen in most counties compared to last week

These data were updated August 18th and represent a seven-day average of the previous week

The southern portions of Virginia are particularly vulnerable

SOCIO-ECONOMIC VULNERABILITY

Source: Surgo Foundation



Researchers from the Surgo Foundation have created a county level socio-economic vulnerability index for COVID

Virginia's southern counties are particularly vulnerable

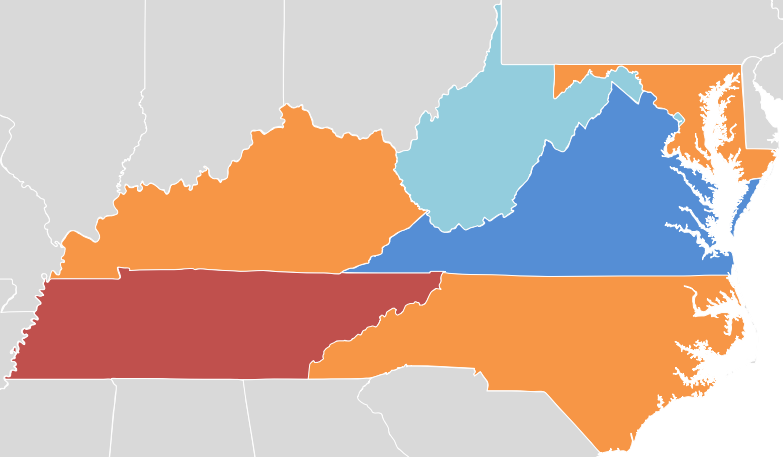
- Cases in this area are also high

Northern Virginia has lower socio-economic vulnerability

These data were downloaded July 15th and represent vulnerability data from 2018

Virginia's neighboring states may have had their second peak

Over the last 7 days, Virginia had 11.1 (-20% from last week) new confirmed cases per day per 100,000



Very high case loads and too-low testing levels:

Tennessee (23.4, -15%)

High Levels of Cases:

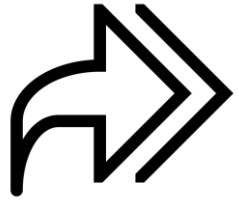
- North Carolina (13.6 new cases per 100k, -9% from last week)
- Kentucky (13.9, +14%)
- Maryland (11.1, -10%)

Lower Levels:

- District of Columbia (9.5 -2%)
- West Virginia (6.7, +4%)

These data were updated August 18th and represent a seven-day average of the previous week

Assessment of the near-term

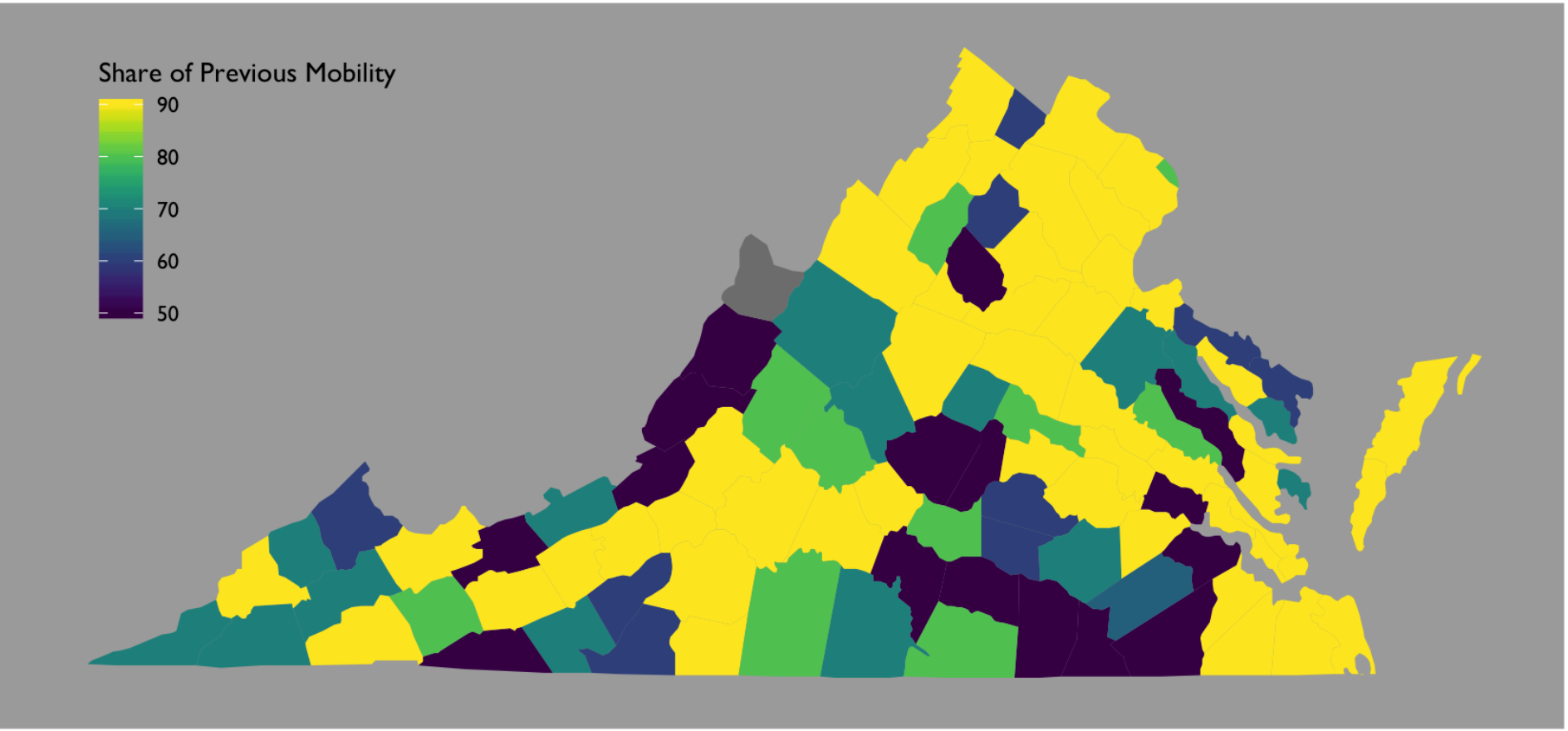


	Current Hospital Census	Near-term Forecasts
Values:	**Confirmed: 872** **Pending: 381**	**Second Peak: 7,300 new cases per day (1,400 to 18,700)** **Near-term: Cases estimated to decline 5% next week and 10% by the first week of September**
Date:	8/18	Estimated Date of Second Peak: 7/30
Notes:	This has plateaued	This is the daily new cases including confirmed and unconfirmed Second peak is estimated to have occurred in the past
Source:	Virginia Hospital and Healthcare Association https://www.vhha.com/communications/virginia-hospital-covid-19-data-dashboard/ Accessed 8/18/2020	Youyang Gu http://covid19-projections.com/us-va Accessed 8/18/2020

Most areas are near pre-COVID levels of activity

MOBILITY

Source: Unacast



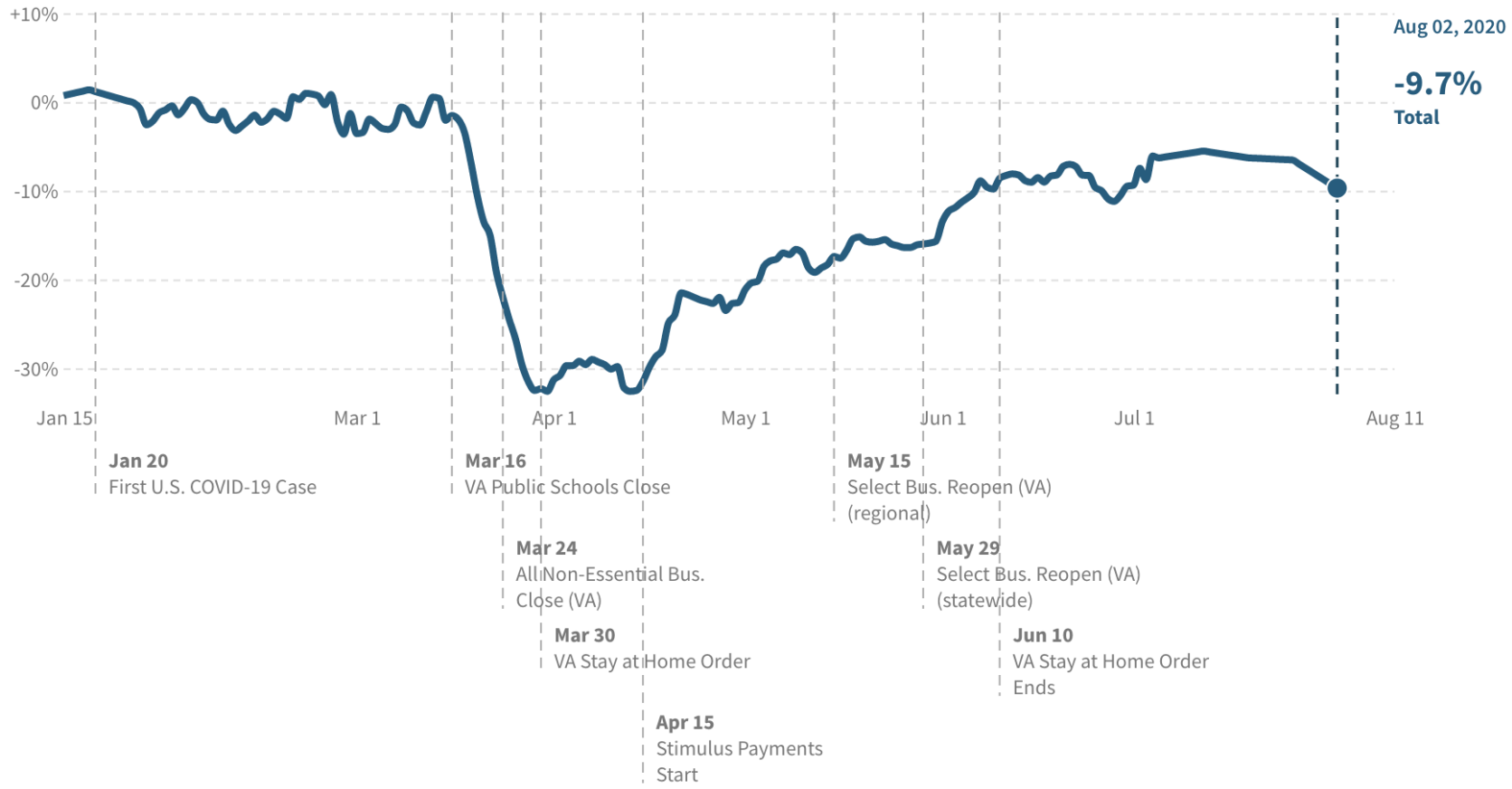
This mobility measure was produced by Unacast using cell phone GPS data and other sources

Their mobility measure is a composite that includes distance traveled, non-essential visits, and encounters

Most of the state has returned to a similar level of activity as before COVID

These data were updated August 18th and represent the previous week

The economic recovery has slowly begun*



Recovery has not been even

- Apparel and general merchandise are down 17% from January
- Entertainment is down 48%
- Grocery is up 8%
- Health care is down 14%
- Restaurants are down 33%
- Transportation is down 51%

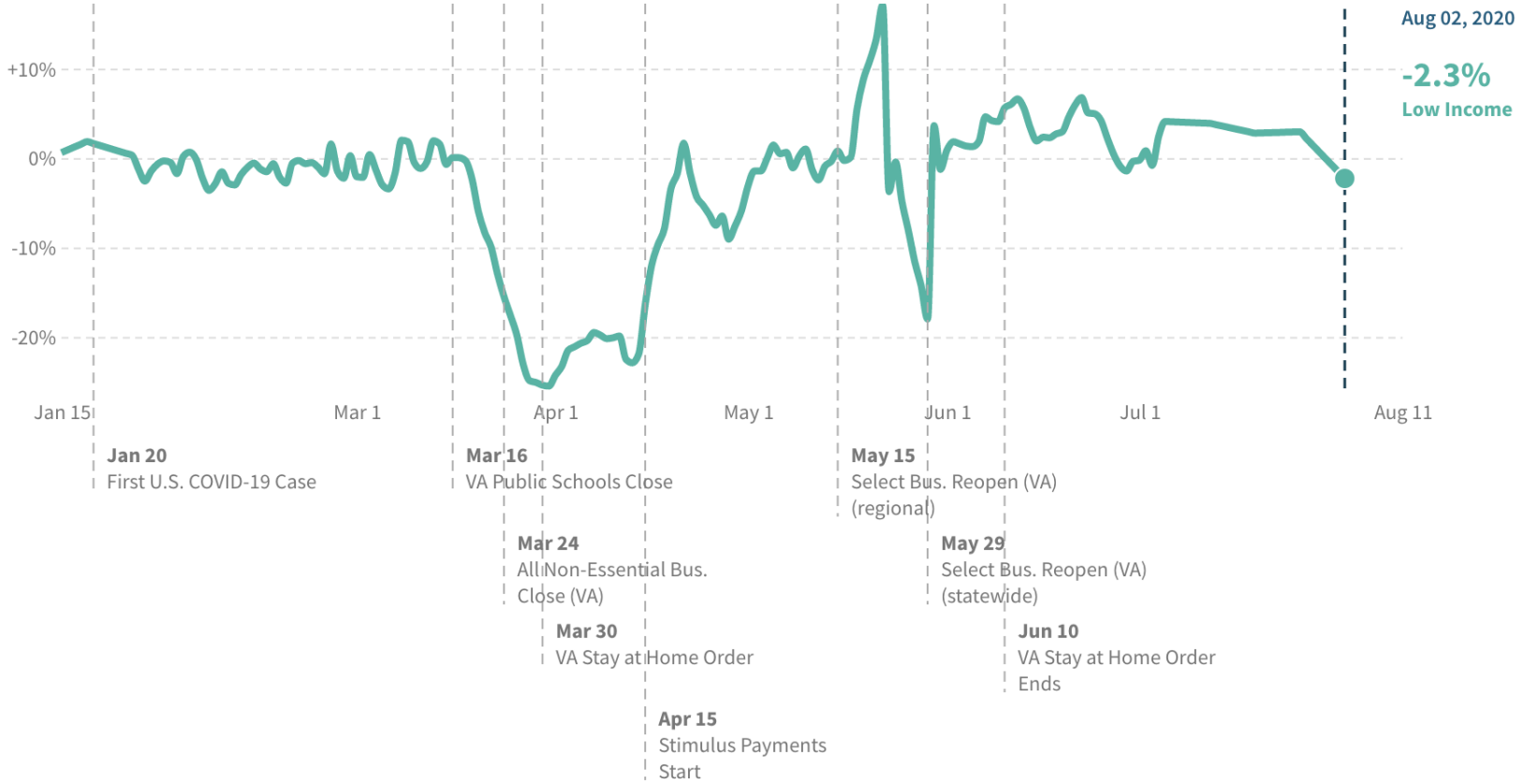
Additional economic activity may increase the rate of spread

- However, people are behaving more responsibly now, which mitigates the risk to some degree

*Chetty et al., used consumer data from several sources to track consumer spending

Graph source: https://www.tracktherecovery.org

Behavior of low-income Virginians will depend on any forthcoming federal stimulus



Low-income is defined as the bottom quartile of Virginia's income distribution

The CARES Act expanded access to unemployment insurance and included an additional $600/week

- This ended on July 25th
- The first missed check was on July 31st

Consumption by low-income households returned to pre-pandemic levels

If the benefits are not extended, patterns of movement may change

- May increase homelessness
- More time may be spent looking for work or seeking social assistance
- Less time and fewer dollars may be spent on consumer activities like shopping

Graph source: https://www.tracktherecovery.org

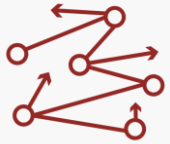
We've been monitoring recent, relevant literature

Chastain et al., looked at the racial distribution of COVID clinical trials

- The Black, Latino, and Native American populations have been overrepresented in COVID cases but underrepresented in clinical trial participants for remdesivir and other pharmaceutical interventions
- This can lead to biases in the efficacy and safety outcome data
- Better outreach is needed for these communities

Beach et al., reviewed data and literature on the 1918 Influenza Pandemic for lessons applicable to COVID

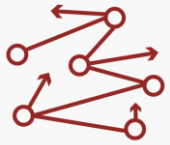
- For a portion of the population, including those in utero, the 1918 Pandemic had long-term adverse health effects, including higher incidences of disability and neurological disorders in the 1920s
- With COVID, there are initial results indicating the potential for similar long-term adverse health effects in some of those infected
- Policymakers should begin considering long-term interventions, such as additional health and educational supports, to mitigate these negative effects



Boudreaux et al., assessed the use of mobile phone surveillance plans for tracing the spread of COVID

- They identified several security and privacy concerns in the apps being developed and used
- They recommend states present a scorecard for the apps to provide transparency and build confidence
- They also recommend states work with community stakeholders to ensure the applications meet community needs and are sensitive to the risks

Additional relevant literature



Glaeser et al., used mobility data and state characteristics to understand how people responded to stay-at-home orders based on risk perceptions

- Based on a regression analysis of state characteristics, they attribute the sharp rise in mobility following the lifting of stay-at-home orders to the belief that the relaxation indicated the COVID risk had ended
- Inconsistent messaging has led to widespread misunderstandings about COVID risks
- In addition to messaging, people also take signals about the COVID risk from policy

Frenier et al., looked at Medicaid data from March to May to understand how coverage has changed

- Medicaid enrollment in Virginia had increased 92,000 by June 1st compared to March 1st
- Garrett and Gangopadhyaya estimate the number of uninsured Virginians will increase by 110,000 to 180,000 depending on longer term unemployment trends
- Coverage churn can disrupt continuity of care, which is important for delivering high quality of care

Fox et al., estimated the chance that someone would arrive to school in the first week of a reopening with COVID under different levels of prevalence and school size

- With the current prevalence in southern Virginia, a school with 500 students would expect to have four infected students or staff arrive in the first week and a 98% chance for at least one infected person
- With the current rate in northern Virginia, about 67% of schools with 500 students would have at least one infected person arrive in the first week
- The size of this initial pool will be related to the risk that the school experiences an outbreak

There are actions that may have an impact

The COVID case rate has been leveling off in Virginia

However, additional measures may be warranted to get case rates low enough to safely restart schools

Mandatory face mask use orders can cause a small but meaningful decline in the rate of spread
(See Lyu and Wehby)

With about 1,000 new cases per day, additional tracers may be required

- More tracers may better follow up on identified cases but are likely to be overwhelmed
- Tracers may also be able to supply useful information that can inform policy

Stay-at-home orders and the closing of non-essential businesses have been found to be effective
(See Courtemanche et al., Cronin and Evans, and Goolsbee and Syverson)

Individual behavior will drive the future spread of COVID

- Strong, consistent messaging about the risk is important to promote safe habits
- Disinformation has played a major role in the lack of compliance with rules and recommendations
- Low-income people may be unable to work from home and face economic barriers to distancing
- Changes to unemployment benefits may change movement patterns and the rate of spread

Discussion and Questions

The policy response has a real and immediate tradeoff

Historically, the regions that had the strongest response to pandemics have had the best economic outcomes

- When accounting for tradeoffs over time, epidemiologic response need not conflict with economic outcomes

The decision to relax restrictions has allowed for aggregate consumer activity to return to near normal

- But the relaxation halted declining case levels and now cases are rising

With the current trends, it likely will not be safe to re-open schools for in-person instruction

- Children appear to have a reduced risk, but are not immune and have had very severe reactions
- Increased interactions place parents, teachers, and staff at greater risk

A strong response now may break the trends in time

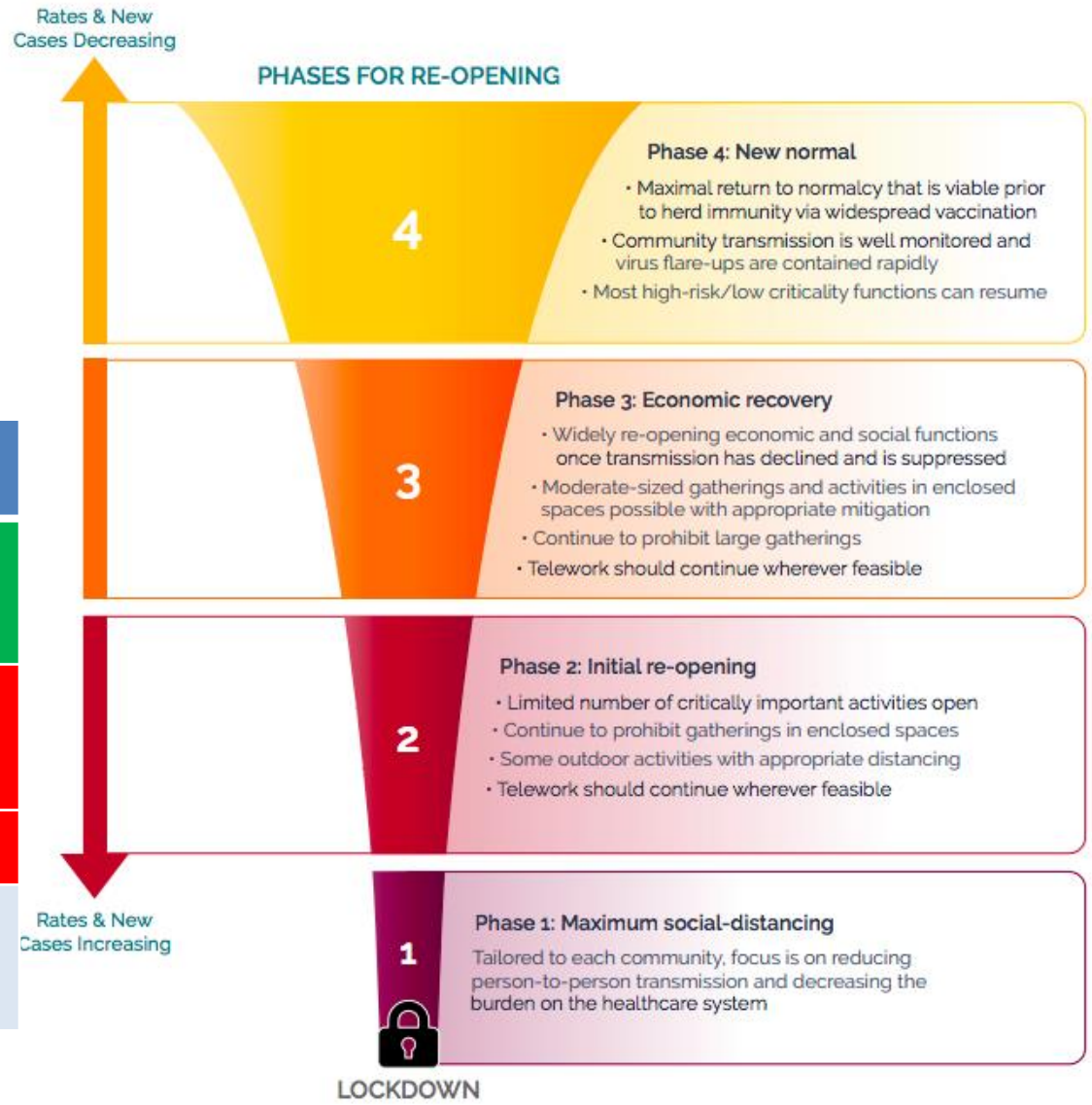
- Given the asymmetric risk, it is better to act too soon than wait too long

Thresholds have been proposed for phased re-openings

COVID-Local developed a series of guidelines for local leaders to assess when it is safe to relax restrictions

- COVID-Local is an effort pulling from researchers from Georgetown, Nuclear Threat Initiative, and others
- Red indicates not met, Green is met, and Yellow is close

Phase	Case trend	Test Positivity	Cases per 100,000
1->2	21-day decline	< 10%	< 25 cases
2->3	Continued Decline	< 3%	< 10 cases
3->4		< 1%	< 1 case
Current Levels	Rising	6.7%	14.5



Source: https://covid-local.org

Risk segmentation has been proposed as a way to accelerate the return to normalcy

Risk Segmentation Example

Occupational Risk	Health Risk: Low: Young and no comorbidities	Health Risk: Medium: Middle age or young with comorbidity	Health Risk: High: Older age or other with comorbidity
High: Contact with confirmed cases	Standard Precautions	Additional Mitigation	High Risk
Medium: Contact with unknown status	Standard Precautions	Standard Precautions	Additional Mitigation
Low: Strict Physical Distancing	Standard Precautions	Standard Precautions	Standard Precautions

Source:

Larochelle, Marc R. "'Is It Safe for Me to Go to Work?' Risk Stratification for Workers during the Covid-19 Pandemic." New England Journal of Medicine 0, no. 0 (May 26, 2020): null. https://doi.org/10.1056/NEJMp2013413.

The risk of adverse outcomes for a given level of social activity can be reduced if distancing decisions are informed by both the risk of exposure to COVID-19 and the expected consequences of exposure

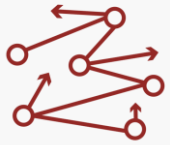
For this example of the risk segmentation:

- Standard precautions include appropriate use of PPE, handwashing, and similar steps
- Additional mitigation would be additional steps to physical distance

Several studies have noted that risk segmentation through targeted isolation permits normal activities for much of the population and has most of the risk reduction associated with a less targeted approach

- There are significant equity concerns for disadvantaged communities
- This requires careful assessments of risk and also additional support for those most at risk

Recent Literature for 8/13



Glaeser et al., used mobility data and state characteristics to understand how people responded to stay-at-home orders based on risk perceptions

- Based on a regression analysis of state characteristics, they attribute the sharp rise in mobility following the lifting of stay-at-home orders to the belief that the relaxation indicated the COVID risk had ended
- Inconsistent messages have led to a widespread misunderstandings about COVID risks
- In addition to messaging, people also take signals about the COVID risk from policy

Frenier et al., looked at Medicaid data from March to May to understand how coverage has changed

- Medicaid enrollment in Virginia had increased 92,000 by June 1st compared to March 1st
- Garrett and Gangopadhyaya estimate the number of uninsured will increase by 110,000 to 180,000 depending on longer term unemployment trends
- Coverage churn can disrupt continuity of care which is important for delivering high quality of care

Fox et al., estimated the chance that someone would arrive to school in the first week of a reopening with COVID under different levels of prevalence and school size

- With the current prevalence in southern Virginia, a school with 500 students would expect to have four infected students or staff arrive in the first week and a 98% chance for at least one infected person
- With the current rate in northern Virginia, about 67% of schools with 500 students would have at least one infected person arrive in the first week
- The size of this initial pool will be related to the risk that the school becomes an outbreak

Recent Literature for 8/6

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

Ziedan et al., looked at the effect of COVID closures on non-COVID health care utilization nationwide using electronic medical record data and found a 40% decline in mid-March with a rebound in mid-April generally preceding policy changes

- Neoplasm and musculoskeletal diseases, outpatient visits, and health status checkups saw significant drop-offs that only partially rebounded
- Circulatory, endocrine, oncology, and mental/behavioral health disease fully rebounded
- There may be long-term health effects associated with the delay of care

Levinson et al., reviewed clinical, epidemiological, and field data to suggest guidelines to reopen schools such as:

- Areas with cases greater than 1 per 100,000 should take steps (e.g., close non-essential spaces for two months) to reduce their rates in advance of opening schools
- Schools should have adequate PPE and regular testing
- Schedules should be altered to limit class sizes and exposure risks

Holtz et al., used mobility data from cell phones, Facebook, and state, local, and federal policies to understand the implications of the lack of coordination between levels of government on restrictions

- Movement across the boarders between municipalities with different policies likely contributed to the spread
- Working with neighboring states to coordinate restrictions (e.g., shutdowns and mask orders) could reduce the spread of COVID

Recent Literature for 7/30

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

Benitez et al., examined racial/ethnic disparities in COVID cases and fatalities from Atlanta, Baltimore, Chicago, New York City, San Diego, and St. Louis through June

- Differences in fatalities appear to be driven by case rates as opposed to differential case fatality
- This work reinforces the literature on the importance of socioeconomic factors for understanding the spread of COVID and its outcomes

Stein-Zamir et al., examined a large COVID outbreak in a high school following Israel's reopening of school

- After two months of school closures, schools in Israel re-opened with "daily health reports, hygiene, facemasks, social distancing and minimal interaction between classes"
- Ten days after schools reopened the first major school outbreak occurred with 13% of students and 17% of staff infected (of a school with 1,200 students)
- As analysis comes out about the spread in schools in Israel, there should be useful lessons learned

Cunningham et al., collected survey data on renters with a focus on those who lost income in May due to COVID

- 18% could not pay rent in June and 8% were threatened with eviction
- Access to unemployment payments greatly reduced the precarity, but that may end soon

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 7/23

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

Cohen looked at the optimal size of COVID testing pools based on prevalence and testing cost

- For Virginia, the optimal testing pool of the general population would currently fall between 8 and 11
- This is consistent with the Ben-Amotz model which has a different functional form and recommends an initial pool of 10 followed by a second pool of 6

Haischer et al., observed 5,517 shoppers across Wisconsin to assess mask wearing patterns

- Overall 41.5% wore masks but men, people in rural areas, and younger people were less likely to wear a mask
- A similar analysis of Virginia would be useful to determine the utility of a mask order

Selden and Berdahl looked at demographic disparities, COVID risk, and COVID outcomes

- The risks for the white population is higher than for other groups because of the higher average age but, for any given age group, on average, the black population has more comorbidities and the Hispanic and Asian populations have fewer
- Employment factors have been associated with higher infections in the black and Hispanic population

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 7/16

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

Glaeser et al., used mobility and case data for five cities to estimate the tradeoff

- They estimate a ten-percentage point decline in mobility reduces the cases by 17 to 27 percent.

Cronin and Evans examined the relationship between restriction policies and population mobility

- Behavioral changes account for about 75 percent of the variability
- Shutting down businesses and facilities is more effective than limitations requiring compliance by the public

Lohse et al., assessed the use of pooled testing in asymptomatic people in Germany and found that 30 people per test could be effective

- Eberhardt et al., responded suggesting sixteen, nine, or three tests depending on the prevalence
- Mishra et al., identified technical barriers based on experience developing a protocol for testing in India

Boulicault et al., studied the COVID surveillance reporting by each state and assigned a grade

- Virginia's score was average and could be improved by including comorbidities and intersectionality information for both case and death data

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 7/9

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

Augenblick et al., modeled the use of group testing in a repeated testing environment with concurrent spread
- So long as the prevalence remains relatively low, group testing is a viable option for mass testing

A team from Cornell developed a model to assess plans to safely reopen
- Universal pooled testing upon return followed by periodic testing
- A substantial portion of the course load will move online
- Different environments, such as urban campuses, may require additional measures

Saldoner et al., studied COVID cases in prison settings using data from all 50 states and also federal facilities
- There are systemic data collection problems in prisons
- Protective measures have not been rolled out to prisons to the same extent as other confined populations

Courtemanche et al., assessed the role of distancing measures in reducing the growth rate of confirmed cases
- Restaurant and business closures reduced the weekly growth rate by 4-6 percent
- Stay-at-home order reduced the growth rate by 9 percent after three weeks
- School closures and caps on groups size did not have statistically significant reductions in the growth rate because behavioral response preceded enaction

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 7/2

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

- Scanned articles and working papers from the National Bureau of Economic Research, Social Science Research Network, New England Journal of Medicine, Journal of the American Medical Association, Health Affairs, and the Lancet

Goolsbee and Syverson used cell phone data to assess the factors that influence mobility

- People primarily reduced their mobility in response to perceived risk rather than policy restrictions
- Policies accounted for only about ten percent of the decline in movement

Ahammer et al., studied the spread of COVID and the timing of in-person NBA and NHL games

- They estimate that mass gatherings increased the spread by 13% in the county hosting the game

McCormack et al., used survey data from 2018 to identify essential workers and households with an elevated risk

- 40% of workers qualify as essential
- 13% of households with an essential worker are high risk because they include an elderly individual, someone without health insurance, or are low income (below $40,000/year)

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 6/25

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

- Scanned articles and working papers from the National Bureau of Economic Research, Social Science Research Network, New England Journal of Medicine, Journal of the American Medical Association, Health Affairs, and the Lancet

Dave et al. examined cell phone data for 281 U.S. cities with Black Lives Matter protests following the death of George Floyd

- The protests were associated with a net decline in mobility because non-protestors were less likely to leave their homes

Martinez et al. reviewed COVID test data (viral tests) from five hospitals in the Baltimore-Washington area and found that 40% of Latinos tested in these facilities were positive for COVID

- Socio-economic factors increase the risk of infection for this population
- Test rates in this community have been too low and may be related to access to care

Sajadi et al. compared the weather and the spread of COVID across 50 cities to assess the seasonality

- They found evidence that a higher temperature and relative humidity were associated with fewer cases

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 6/18

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

- Scanned articles and working papers from the National Bureau of Economic Research, Social Science Research Network, New England Journal of Medicine, Journal of the American Medical Association, Health Affairs, and the Lancet

Hanson et al. from RAND analyzed COVID case data and air traffic patterns to identify the role of air travel in the global spread

- By the end of January, at least 1.5 infected passengers per day were leaving China
- As the rate of air travel grows, careful monitoring of national and international infection rates will be needed to understand the risk of additional spread within Virginia

Papageorge et al. examined the socio-demographic characteristics associated with taking precautionary measures

- Men were much less likely to take precautionary measures
- People with a lower income, an inability to tele-work, or without yards were less likely to engage in distancing

Lyu and Wehby compared county-level COVID case growth rates for states and locales with and without mandatory face mask use to determine efficacy

- The mandatory use of face masks is associated with a reduction of two percentage points in the COVID case growth rate

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 6/11

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

- Scanned articles and working papers from the National Bureau of Economic Research, Social Science Research Network, New England Journal of Medicine, Journal of the American Medical Association, Health Affairs, and the Lancet

Price-Haywood et al. document the health outcome differences between black and white COVID patients (n = 3,626) in three Louisiana hospitals

- While black COVID patients had significantly higher per capita hospitalization rates and a higher mortality rate than white patients, this variation in mortality could be explained by sociodemographic and clinical characteristics
- Living in a low-income neighborhood was associated with worse outcomes, which indicates the importance of social factors that may include timely access to care
- Other studies, such as Azar et al., have found race to be significant even when controlling for these factors
- There is a growing body of literature on the complex interactions of race and adverse outcomes and additional work is needed

McMichael et al. detailed the spread of COVID in a long-term care facility

- The outbreak within the facility included both health care personnel and visitors, though residents had the worst outcomes

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 6/4

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

- Scanned articles and working papers from the National Bureau of Economic Research, Social Science Research Network, New England Journal of Medicine, Journal of the American Medical Association, Health Affairs, and the Lancet

Marc Larochelle highlighted the use of risk segmentation assessments of when it is safe to return to work

- This study reinforces the analysis of earlier economic studies on risk segmentation as an approach to accelerated relaxation of distancing policies

Li et al. examined mental health factors for young physicians in China responding to COVID and found a substantive increase in stressors

- This supports a growing body of literature on the mental health implications of COVID on the supply of care
- Provider capacity may decline over time as COVID stresses accumulate

Mangrum and Niekamp looked at the effect of spring break timing on the spread of COVID among destination locations

- College students traveling for spring break had a meaningful effect on the spread of COVID

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 5/25

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

- Scanned articles and working papers from the National Bureau of Economic Research, Social Science Research Network, New England Journal of Medicine, Journal of the American Medical Association, Health Affairs, and the Lancet

Arons et al. found that pre-symptomatic testing in a skilled nursing facility allowed for more rapid isolation and likely lowered spread

Chari et al. use a model of isolation policies and find that targeted isolation substantially reduces economic damage and captures much of the reduction in spread when compared to a blanket isolation policy

- Targeted populations should include the likely exposed
- Other similar papers include the population most at-risk to negative health effects for targeted isolation

Nguyen et al. use cell phone and Google data from before and after the relaxing of physical distancing to assess changes in mobility

- Across four different mobility measures, they estimate that mobility increases four to eight percent over pre-relaxation level in the first few days after the ending of stay-at-home orders

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 5/18

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

- Scanned articles and working papers from the National Bureau of Economic Research, Social Science Research Network, New England Journal of Medicine, Journal of the American Medical Association, Health Affairs, and the Lancet

Courtemanche et al. assessed the role of distancing measures in reducing the growth rate of confirmed cases

- Restaurant and business closures reduced the weekly growth rate by 4-6 percent
- Stay-at-home order reduced the growth rate by 9 percent after three weeks
- School closures and caps on groups size did not have statistically significant reductions in the growth rate because behavioral response preceded enaction

Hellewell et al. modeled the use of test and trace to determine the necessary scale for different assumptions

- The comprehensiveness of the tracing (the number of contacts per case needed to be traced to prevent a new outbreak in three months) depends on the rate of spread
- If R is 1.5, only half of the contacts need to be traced while, if R is 2.5, 70 percent of contacts must be traced

Favero et al. estimated economic and health outcomes associated with different sequences and timing for relaxing restrictions

- Allowing young people (20-29 years of age initially and up to 49 later) to take more risks can allow for a swifter return to normalcy

New studies are released daily and many of these studies will improve with more and better data

Recent Literature for 5/11

We are also monitoring the recent literature on COVID modeling that might be relevant to Virginia

- Initially focused on working papers from the National Bureau of Economic Research

Rojas et al. estimate that the economic effects are primarily due to the epidemiological conditions and not the policy

- Implies that estimates of relaxation polices could overstate economic benefits if behavior doesn't match response

Montenovo et al. studied the factors associated with COVID job loss

- Several characteristics are associated with a higher likelihood of job loss: race, gender, education, and age
- Economic recovery policies will need to consider equity

Lin et al. examined a long list of policy interventions to identify tradeoffs between health and economics

- Objectives of minimizing adverse health outcomes and economic damage were not in opposition in earlier pandemics
- Places with better coordination between economic and health policy and also with neighboring jurisdictions had better outcomes

Acemoglu et al. consider a population with different risk levels and proposes relaxing distancing by age group

New studies are released daily and many of these studies will improve with more and better data